Achieving Sustainability Learning through a Cloud-Based Online Learning Platform

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Abstract
It is undeniable that the utmost goal of education is to enlighten one's critical thinking and allow one to appropriately utilize knowledge while being able to pass knowledge to the next generation effectively. However, learning atmosphere is always discouraged with piles of learning materials and lack of hands-on experiences. With only the completion of verbal lectures, including some brief concepts, it cannot help students thoroughly understand the capabilities of some sound systems, like Enterprise Resource Planning (ERP) system, in practical corporate operations. Apart from knowledge management, acquisition of more hands-on experience is absolutely another essential topic which helps students in developing a self-competitive advantage. Therefore, a sophisticated Cloud-based Online Learning Platform (COLP) with role playing model is proposed. This proposed platform is to be jointly carried out by departments across faculties so as to take advantages of interdisciplinary subjects and programs, as well as to support the learning process of interdisciplinary programs. Students can equip themselves well for the real business environment by hands-on simulation practices, as well as experience the importance of a seamless information system, while teachers can collect and evaluate performances and learning behaviours of students for continuous improvement in learning and teaching. It is expected to create an increased value learning experience by an interesting, role-playing approach, but at the same time, reduce cost concerns and disturbance risks, in terms of demanding specifications of the server and computers, in holding a medium sized laboratory session.

Keywords: Online Learning Platform, Cloud Computing, Virtual Lectures

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1. Introduction

In this fast moving society, education industry has been putting an increasing effort to focus on improvement in learning experience rather than only the teaching quality, by which can only be achieved if teachers understand students' learning behaviours and difficulties, so that proper subjects' syllabuses and materials can be formulated. However, it will not be an easy task for teachers to figure out the exact learning difficulties among students and correct their misunderstanding when they have a lack of hands-on experience and actual vision what they learned. This kind of ineffective communication between teachers and students may result in discouraging the learning atmosphere in the class, and underestimate the power of some outstanding systems, like Enterprise Resource Planning (ERP), Material requirements planning (MRP), and Customer Relationship Management (CRM). On the other hand, as a result of the interdisciplinary intention, more and more students from different disciplines in business and engineering are attending particular subjects together. However, the differences in ability, background, and thinking could be a barrier between them and bring a negative effect to the overall learning process. Engineering students with superior technical knowledge are more practical and specialized in development while business students work well in planning and organizing issues using their business management knowledge. Thus, in order to initiate participation and integration, a cloud-based online learning platform is proposed to assists students to prepare themselves well for the real business environment, and facilitate intercommunication, knowledge sharing, and reflection on the learning outcome.

2. Literature Review

A massive development in E-learning has been discovered in recent years, not only in the industry but also in academia (Aparicio & Bacao, 2013). E-learning is a concept that emerged with the use of networked information and communications technology (ICT) to deliver digital content in a learner-orient environment (Maskare & Sulke, 2014). There are various terms used to identify modes of teaching and learning, such as blended learning (Bensch & Rager, 2012), online learning (Madan, Pant, Kumar & Arora, 2012), virtual learning (Chen, 2016) and so on. Nowadays, the above-mentioned modes have already become an essential component in the education industry, which enables a flexible learning venue, many teaching modules and content deliverables (Dykman & Davis, 2008; Bosamia & Patel, 2016). It is undeniable the evolution of learning environments provides us many advantages, yet there are still difficulties for its implementation (Masud & Huang, 2012). It was common to find out more than one online learning platforms were using in a single department or faculty, even though some major functions overlapped (Frankfurth & Schellhase, 2006; Balina, Baumgarte & Salna, 2017). Some researchers, such as Woelk (2002), revealed that this phenomenon was contrary to the economic and technological standpoints. On the other hand, some researchers defended that many of the educational institutions may not have sufficient resources for developing and managing an isolated learning system. In order to prevent a high investment cost of tailor making a one-stop E-learning solution, they concern about what the commercial platform could be provided, rather than the proportion of duplicated functions. With the help of growing popularity of cloud computing technology, the

infrastructure of E-learning has been evolved into the next generation, which is even more flexible, cost saving and demand driven platform (Don, Zheng, Yang, Li & Qiao, 2009; Bensch & Rager, 2012).

2.1 Cloud-based Online Learning Platforms

Cloud computing technology can be identified as a delivery model of computing resources, which provides a pool of highly scalable services over the Internet (Maskare & Sulke, 2014). It enables real time development, deployment and consumption of a broad range of products, services, and solutions. There are several modules can be configured based on user requirements, and then delivered by variable distribution channels.

It has been proven that using cloud computing for education has brought many advantages over the traditional way. For example, low initial investment cost (i.e. hardware, software, and experts), and high scalability, mobility, and accessibility (Madan et al., 2012). Cloud-based platforms make centralized potentials of the software installation, storage requirement share, and maintenance. Thus, licensing costs are expected to be decreased (Chandran & Kempegowda, 2010). A data centre can be used to serve the whole institution by providing infrastructure and storage as a service. Users can use any devices connected to the Internet, including Personal Computer (PC), smart phones, tablets, and so on. As technology brings convenience to our life, Blackboard (Beran, Mach, Schikuta & Vigne, 2011) and Moodle (Morgado & Schmidt, 2012), as the leading companies in the online education software industry, have also expanded to the cloud-oriented market (Pocatilu, 2010). However, the learning platform for students is still not totally integrated with the academic assessment and management, especially for those duplicated subject contents. Hence, there is a need of a comprehensive enterprise system that enables sound information system integration, management, and supervision. In this paper, a sophisticated Cloud-based Online Learning Platform (COLP) will be introduced which can scale the online learning system both horizontally and vertically.

3. Design of Proposed Cloud-based Online Learning Platform

To develop a Cloud-based Online Learning Platform (COLP), there are several steps needed, namely system definition, learning platform development, teaching materials preparation, platform testing, trial deployment, and system evaluation. This paper is using Enterprise Resource Planning (ERP) for study, because this system, being employed in most enterprises and along their supply chains, is a comprehensive enterprise system that enables sound information system integration, management, and supervision. Other than monitoring information, resources and capital flows, this system also allows better planning process in many operations, such as procurement, production, storage, etc. Students in different disciplines involve as different parties. It is a system that can show the greatest contribution of what online learning platform can bring.

Figure 1 highlights the main issues on the systems' characteristics have to consider, namely the application scope, system's flexibility, complexity and strategic importance, users' involvement, consultant employment, technological infrastructure, vendor

relationship and organizational process. The comprehensive designs of the system modules enable practical experiences for students and personalized teaching.

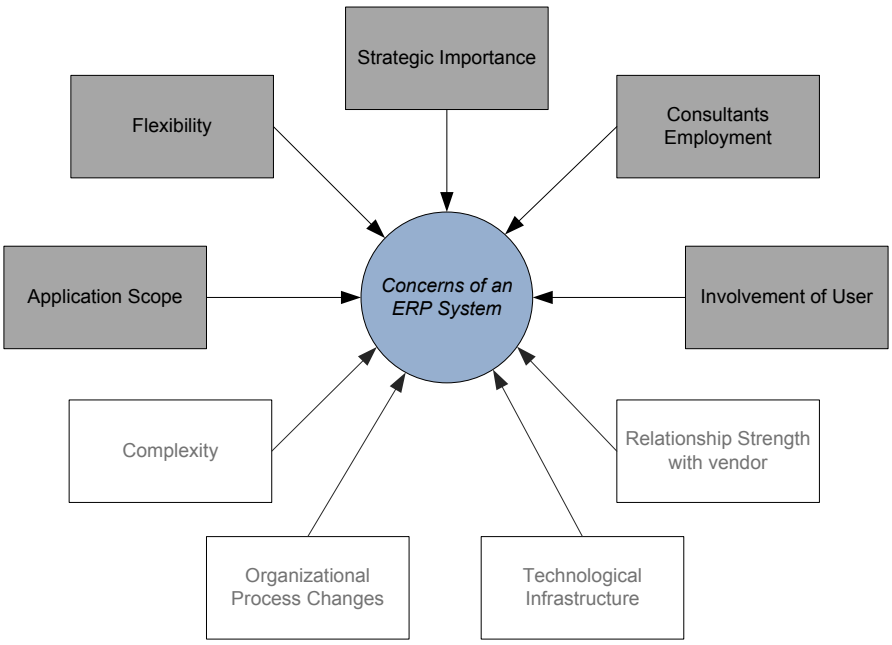

Figure 1: Main characteristics issues of setting up a virtual ERP system

After defining the system characteristics, the development of learning platform needs to match with the academic syllabus, which to ensure what they could experience are what they learnt. Currently, the traditional teaching approach is to introduce the operations to students in black and white. Apparently, students will get bored and confused in piles of worksheets because they do not think the learning experience is valuable, so the effectiveness of learning is diminished. This is what will happen if students cannot actually experience the systems in a real business situation. To solve this problem, some learning tasks in interesting, yet practical competition is put inside in order to draw students' interest and attention on how the functions and capability of the system can help in various industries. Moreover, students may not be able to experience the documentation, information flow and cooperation in the system. In view of this, it is proposed to let students act as different parties along the supply chain as a practical group project and carry out daily operations intra- and inter-corporation wise via the simulation environment.

As shown in Figure 2, the proposed Cloud-based Online Learning Platform (COLP) for ERP system enjoys the benefits of cloud technology with high-performance computing and centralized data storage. The entire ERP simulation system located at the cloud centre is constructed to perform numerous management tasks, such as procurement, production planning, inventory control, sales, etc., in order to cope with the simulated market demand so that students have to provide strategies to become more adaptable to market changes. For the back end server, the scattered computation equipment is gathered and aggregated into a more powerful processer to handle various tasks while the students' commands distribute over the whole day instead of being limited to laboratory sessions.

This cloud approach not only strengthens the processing and computation power but also lowers the access barrier by using a browser of desktops or mobile devices, even students use the platform at home. Students with different roles can communicate with other parties through a user-friendly front end interface. When a student receives a task notification, he or she can log in to the ERP simulation system using the given identity, role and account details which are assigned beforehand and perform their duties using the mobile device application.

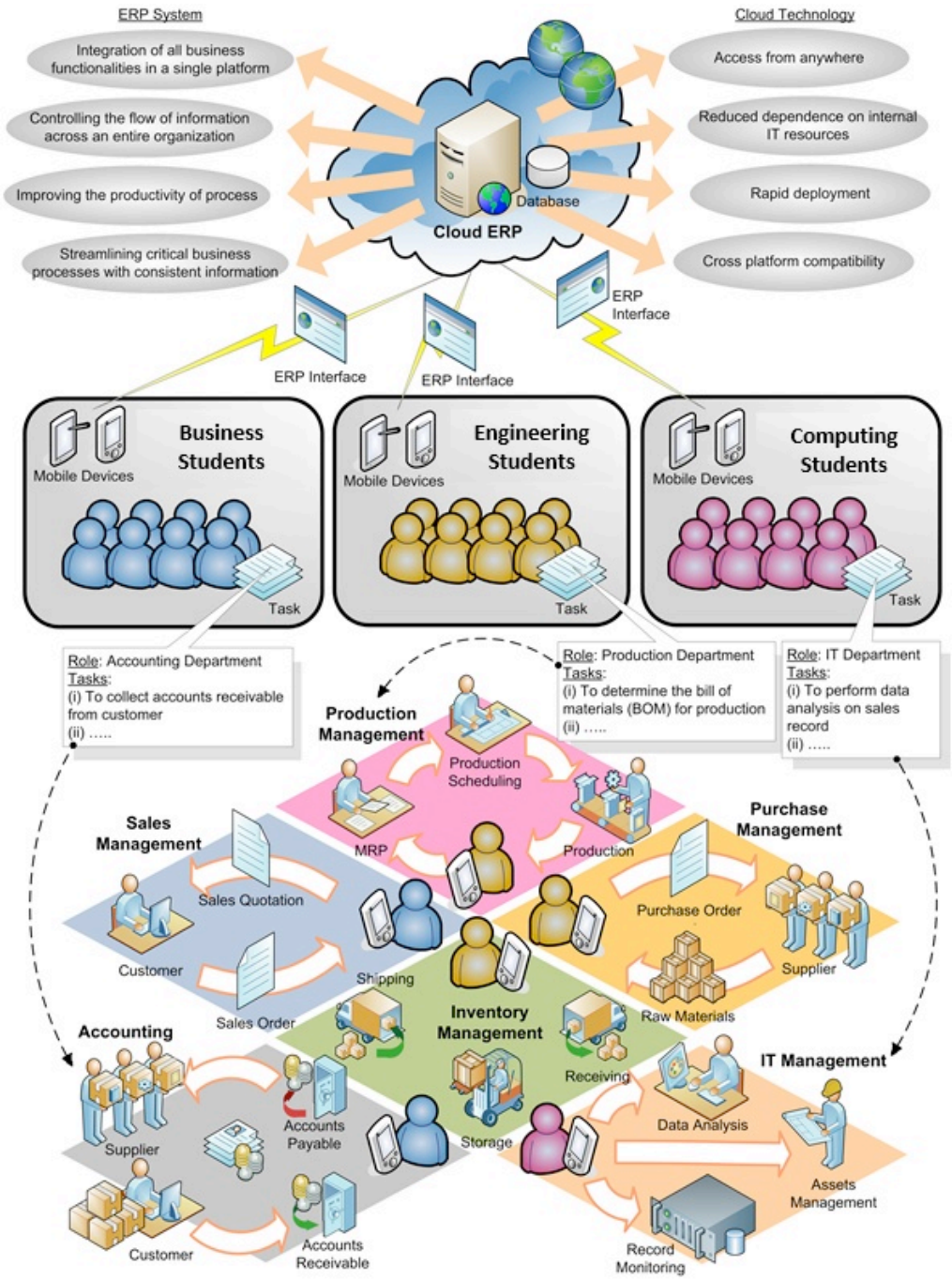

Figure 2: Framework of the Cloud-based Online Learning Platform for ERP system

The learning platform will occupy two or three laboratory sessions by giving students an introduction to this platform and some hands-on experience about the ERP simulation system. Before these laboratory sessions, taught lectures are still the core channel delivering the basic concepts and general knowledge to students. In general, the laboratory sessions can be divided into two parts, self-learning and case-based demos will be conducted in the first half while the second half is review and discussion.

Once students get the idea of this learning platform after self-learning, they are then assigned with roles and corresponding tasks for the real run in a period of time, say, a week, outside the laboratory. According to the given information, they have to analyse and perform their duties by transmitting the right information at the right time via the platform. When there is uncertainty or difficulty, they can search for useful information in the learning platform application or the guidebook. After a period of time, the roles of the students will be changed and rotated among the modules under the ERP system. So, they can familiarize the system well in the view of different roles.

Finally, this innovative teaching method not only provides students with an invaluable hands-on experience but also gives the teacher a better performance measurement in their work and also the course itself.

3.1 Role playing model

Cloud computation is the major trends of future business operations, students can take this advantage to experience the operations of the simulated cloud-based ERP system. It is believed that exposure to these state-of-the-art technologies, such as cloud technology, internet of service and online learning platform, equips our students well for better business environment adaption in their near future. Students will be given a valuable chance to develop their own insights no matter in the system structure or the supply chain workflow by earning real operational and practical experience other than pure theoretical knowledge. On the other hand, their professional competences can be strengthened to handle daily operations, business coordination, system implementation and even information system establishment in a working environment through this hands-on experience. This new problem-based learning approach shall nurture students to become life-long learners and benefit even after graduation. It is believed that this platform can enhance knowledge and experience acquisition for students, especially for those studying subjects related to business flows and information systems.

3.2 Interdisciplinary platform

This online learning platform development project is to be jointly carried out by departments across faculties so as to take advantages of interdisciplinary subjects and programs as well as to support the learning process of interdisciplinary programmes (Balina, Baumgarte & Salna, 2017). With the involvement of students in different disciplines, participants are expected to integrate knowledge learnt, communicate and share thoughts from different backgrounds, in order to contribute to in-depth group discussions when facing difficulties. What is more, the learning platform promotes

students to work as a team to experience the capability of a powerful information system and the importance of seamless coordination in the current business environment. After completion of this proposed online learning module, it is believed that students will be able to develop their professional capabilities, sharpen their senses and mind sets and get ready to make contributions in the current competitive environment.

3.3 Online communication and assessment

In the view of teaching, this approach does not restrict this laboratory to be held within the scheduled session only but enables the experiment to last longer and continue even when students are not in the same field. In addition, with the help of tailor-made analytical tools, the performance of both individuals and groups, say, department, corporation, or supply chain, can be reviewed so that appropriate feedback and advice can be given to students for improvement. On the website, a list of frequently-asked questions will be uploaded for students to self-learn and tackle their problems found in the learning process. At the same time, an online Q&A session will also be produced to cope with students' questions and consultation needs. Subject lecturers and supporting teaching assistants will be responsible for answering any question which is beyond the Q&A section.

To evaluate students' ability under this new approach, apart from lecture performance, teachers can easily make reference to the transactional record and some other corresponding results from the system as well. Students' learning effectiveness can help reflect teaching performance while the students' thought behaviour demonstrated can greatly help teachers understand their strengths, weaknesses, and learning difficulties. It offers a crucial way for teachers to recognize each individual's strength and weakness in learning, and promote students' feedback and involvement so to help achieve continuous improvement. Interactive communication and positive complementary effects are encouraged in various issues, such as studying, thinking, and development, between student and teachers with different backgrounds over this platform. Continuous improvement in both the teaching and learning experience could then be achieved.

3.4 Virtual Lectures

The animation is a core media in the taught lectures, which will also be applied instead of case sharing and the case study presented in "black-and-white". Virtual lectures with animations will be well produced in the project as shown in Figure 3. A teaching staff can deliver a virtual lecture by providing a single photo and teaching materials. A vividly "animated lecturer" will be created by using Auto Motion engine and Facial Animation Software (Kasperiuniene, Jariwala, Vaskevicius & Satkauskas, 2016). The "animated lecturer" can deliver a lecture, namely a virtual lecture, with smooth lip-syncing results and facial expression created for meeting the needs in talking and speech. Hence, students can attend the virtual lectures with the highest time flexibility. Also, the virtual lectures can be updated anytime which is far much more time-saving than traditional education clips production or recording. More importantly, in terms of continuous improvement, students' involvement and feedback are the first-hand and real input for

performance measurement and evaluation. The valuable information benefits not only a specific subject but also the related ones from this interactive approach. The gained experience and peer sharing could further light up the improvement direction in both teaching preparation and lecture delivery.

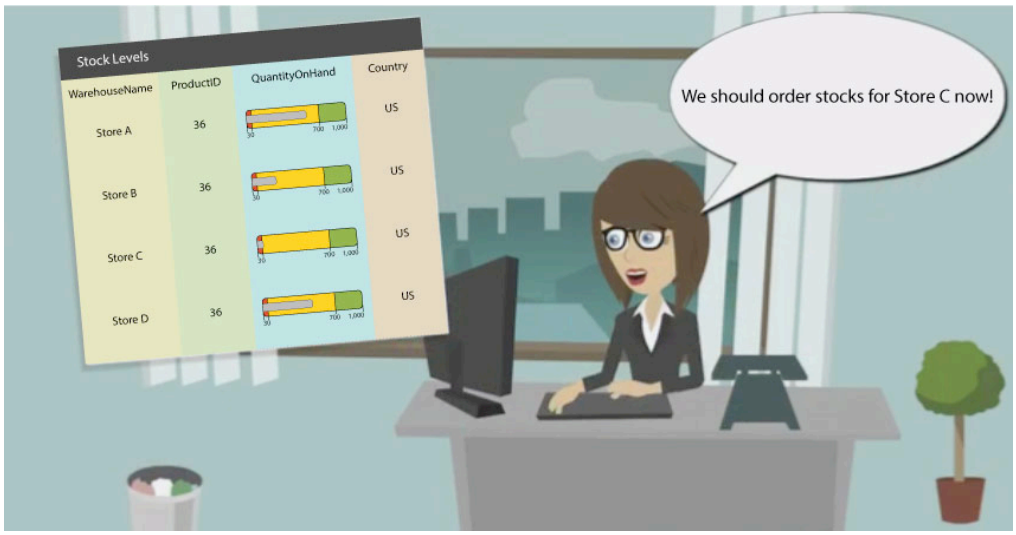

Figure 3: Example of Animation for a Case/Scenario illustration

To evaluate the quality of the deliverables of this learning platform, an evaluation plan is established which is shown in Figure 6. At first, numbers of measurements have to be defined before a trial run, for example, learning experience and effectiveness, platform suitability, and teaching performance. To facilitate the evaluation process, two trial deployments will be carried out for reviewing how the learning platform performs and users experiences. After the deployment period, we will use questionnaires to collect comments and opinions on the platform and materials, and moreover, the impressions of this innovative learning approach. In general, the feedback and quantitative data including the maximum number of students handed, the operation and loading time, the number of errors occurring, and so on, are turned into improvement requests to the project team and system developer for debugging and refinement. For the last phase, the second trial will be deployed in-class to about 60 students for a completed evaluation of the project's deliverables. The students will be given a predefined time period for performing functions in this ERP simulation system, after that, we will distribute the questionnaires to all of the students through the corresponding function module in the system. Furthermore, the teacher can get the result which is ready for statistical or analytical use. In this section, the questionnaires will focus more on the qualitative data, say the overall learning experience, effectiveness and usefulness, so as to give a general idea of how this teaching approach performs and is an improvement indicator in the comparison with the traditional method. Finally, a review meeting will be held to gather and analyse the information and feedback collected in order to find out the effectiveness and efficiency of this proposal, and as well as the pros and cons.

Figure 6: Evaluation plan of developing the Cloud-based Online Learning Platform

Conclusions

Education is the key to develop a good personality. The more we learn, the more we grow. This research has proposed a Cloud-based Online Learning Platform (COLP) that enables hands-on experiences in real case scenario simulations, knowledge exchange between interdisciplinary students, highly accessible and flexible teaching materials, and also continuous improvement via performances monitoring and learning behaviour evaluation. The developed platform allows flexible access, operate and learn anytime and anywhere via web browsers or mobile applications. Students can experience and apply what the learnt in a cross departmental manner, while teachers can collect and evaluate students' performance and learning behaviour for continuous improvement in learning and teaching. As the fast-growing and sophisticated cloud computing technologies, online learning platform will certainly enter a new generation.

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